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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/774,298	02/06/2004	William Allen Rogers JR.	VEL03-GN003	5458

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EXAMINER

MERKLING, MATTHEW J

ART UNIT	PAPER NUMBER
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1795

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/774,298	Applicant(s) ROGERS ET AL.	
	Examiner MATTHEW J. MERKLING	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 March 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) See Continuation Sheet is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,7-9,11-15,17,18,20,22,26,29,31-33,48,53,54,57,58,61,62,66,68-74 and 97-110 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>1/8/09</u> . | 6) <input type="checkbox"/> Other: _____ |

Continuation of Disposition of Claims: Claims pending in the application are 1,7-9,11-15,17,18,20,22,26,29,31-33,48,53,54,57,58,61,62,66,68-74 and 97-110.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 7-9, 11, 12, 17, 18, 20, 22, 26, 29, 31, 33, 57, 61, 62, 64, 66, 68-70, 74, 99, 102-105 and 107-109 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gonjo et al. (US 6,159,434) in view of Reiser (GB 2128013).

Regarding claims 1, 7-9, 11, 12, 17, 18, 20, 22, 26, 29, 31, 33, 57, 64, 66 and 74,

Gonjo discloses a chemical process system comprising:

a steam conduit (methanol and water conduit, see Fig. 1A);

a hydrocarbon conduit (methanol and water conduit, see Fig. 1A);

a fuel conduit (off gases conduit, see Fig. 1A);

an oxygen source conduit (air conduit, see Fig. 1A);

a product conduit (reformed gases conduit, see Fig. 1A);

an exhaust conduit (combustion gases conduit, see Fig. 1A);

a first microchannel module including:

a first set of microchannels (upper reforming portion of plate style reactor, see Fig.

1A) in communication with the steam conduit via a steam manifold, the hydrocarbon

conduit via a hydrocarbon manifold, and the product conduit via a product manifold (see

Fig. 1A where each conduit is joined with the associated microchannels), the first set of microchannels including a first steam reformation catalyst (in reforming portion 4); and

a second set of microchannels (upper combustion portion of plate style reactor, see Fig. 1A) in communication with the fuel conduit via a fluid manifold, the oxygen source conduit via an oxygen source manifold, and the exhaust conduit via an exhaust manifold (see Fig. 1A where each conduit is joined with the associated microchannels), the second set of microchannels being in thermal communication with the first set of microchannels (combustion heat is thermally transferred to the reforming reaction, see abstract); and

a second microchannel module fluidically arranged in parallel with the first microchannel module (see Fig. 9 which indicates two microchannel modules, upper and lower, which operate in parallel) and including

a third set of microchannels (lower reforming portion of plate style reactor, see Fig. 1A) in communication with the steam conduit via the steam manifold, the hydrocarbon conduit via the hydrocarbon manifold, and the product conduit via the product manifold (see Fig. 1A where each conduit is joined with the associated microchannels), the third set of microchannels including a second steam reformation catalyst (in reforming portion 4); and

a fourth set of microchannels (lower combustion portion of plate style reactor, see Fig. 1A) in communication with the fuel conduit via the fuel manifold, the oxygen source conduit via the oxygen source manifold, and the exhaust conduit via the exhaust manifold (see Fig. 1A where each conduit is joined with the associated microchannels), the fourth

set of microchannels being in thermal communication with the third set of microchannels (combustion heat is thermally transferred to the reforming reaction, see abstract).

While Gonjo teaches a plate style chemical process system that is designed to be compressed together in order to prevent leaking reactants and products (see col. 14 lines 27-35), Gonjo fails to disclose the chemical process system contained in a pressure vessel and also fails to disclose the associated pressure control devices incorporated by said pressure vessel.

Reiser also discloses a chemical process system that comprises a plate style apparatus (fuel cell stack, 10, see Fig. 1, page 1 lines 105-110) that addresses the same problem of leaking from a plate style chemical process system (see page 1 lines 53-59).

Reiser teaches: a pressure vessel (14) at least partially containing a operation therein (10, see Fig. 1), the pressure vessel concurrently adapted to be occupied by a medium (such as inert gas, supplied) to compress the chemical reactor in order to prevent any leaking of reactants or products from the chemical reactor by maintaining a pressure inside the pressure vessel higher than the pressure in the chemical reactor (page 1 lines 45-52);

a stream adapted to be in fluid communication with an inert medium source (same as inert gas mentioned above) for conveying the inert medium from the inert medium source and into fluid communication with the first chemical reactor (page 1 lines 45-52); and

a recycle stream for cycling the compressive medium into and out of the pressure vessel (see flow diagram of Fig. 1).

Reiser teaches this pressure vessel as an effective means for preventing the leaking of valuable reactants and products from a chemical reactor that is comprised of a plate style apparatus (page 1 lines 45-59).

As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to add the pressure vessel and associated structure of Reiser, to the chemical process system of Gonjo in order to further prevent valuable reactants and products from leaking out of a chemical reactor.

Regarding limitations recited in claims 1, 7-9, 17, 22, 31 and 68-70 which are directed to a manner of operating disclosed system, neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP §2114 and 2115. Further, process limitations do not have a patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim.

Regarding claims 61 and 62, Gonjo further discloses the heat exchanger (such as catalytic combustion portion, 6a or 6b) includes a chemical reactor (catalytic combustor) in thermal communication with the first chemical reactor (reformer).

Regarding claim 99, Gonjo further discloses the oxygen source conduit is adapted to supply air to the second set of isolated microchannels (air is supplied to the combustion portion of the microchannels, see Fig. 1A).

Regarding claim 102, Gonjo further discloses the oxygen source conduit and oxygen source manifold are adapted to supply air to the second set of microchannels and the fourth set of microchannels (air is supplied to the combustion portion of the microchannels, see Fig. 1A and 9).

Regarding claim 103 and 107, Gonjo further discloses the first set of isolated microchannels and the second set of isolated microchannels include an arrangement of repeating units (see Fig. 9 which discloses two identical units operating in parallel).

Regarding claim 104 and 108, Gonjo further discloses one of the repeating units includes

a reactant microchannel (channel in which reaction takes place in the reforming portion 4) and a product microchannel (channel in which the reformed gas leaves the chemical process system, see Fig. 1A and Fig. 12) of the first set of isolated microchannels, and

a fuel microchannel (channel in which fuel/off gas enters the second set of isolated microchannels), an oxygen source microchannel (channel in which the air enters the second set of microchannels), and a product microchannel (channel in which the combustion exhaust leaves the chemical process system) of the second set of isolated microchannels; and

wherein the reactant microchannel of the first set of isolated microchannels is adjacent the fuel microchannel of the second set of isolated microchannels (see Fig. 1A which discloses the reactant microchannel (reforming portion 4) and the fuel microchannel (combustion portion) adjacent to each other).

Regarding claim 105 and 109, Gonjo further discloses the oxygen source microchannel interposes the fuel microchannel and the product microchannel of the second set of isolated microchannels (see Fig. 1A which discloses the air inlet is between the fuel inlet and the product/exhaust outlet).

3. Claims 106 and 110 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gonjo et al. (US 6,159,434) in view of Reiser (GB 2128013) as applied to claim 105 and 109 above, and further in view of Romatier (US 6,190,624).

Regarding claims 106 and 110, Gonjo does not explicitly disclose the repeating unit includes

two reactant microchannels of the first set of isolated microchannels interposed by the product microchannel of the first set of isolated microchannels,

two oxygen source microchannels of the second set of isolated microchannels interposed by the product microchannel of the second set of isolated microchannels, and

two fuel microchannels of the second set of isolated microchannels interposed by the two oxygen source microchannels of the second set of isolated microchannels and the product microchannel of the second set of isolated microchannels.

However, Gonjo does teach, throughout the reference, of heat integration between all the streams (see abstract and drawings, for example) in a plate style reactor.

Romatier also teaches heat integration between channels in a plate (see abstract).

Romatier teaches a reaction flow channel and heat transfer channel which are arranged about each other in an alternating fashion (see Fig. 6) as a preferable means of

heating/preheating fluids in a plate style reactor and making the resulting structure more compact (see abstract).

As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to utilize an alternating channel arrangement (as taught by Romatier) in the plate style reactor of modified Gonjo in order to provide a compact design for the plate reactor as well as preheating the incoming streams with the exiting heated product streams.

4. Claims 13-15, 32, 48, 53, 54, 58 and 71-73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gonjo et al. (US 6,159,434) and Reiser (GB 2128013) as applied to claims 1, 17 and 25 above, and further in view of Toole et al. (US 4,167,915).

Regarding claims 13-15, 32, 48, 53, 54, 58 and 71-73 Gonjo, as modified by Reiser and discussed in claims 1, 17 and 25, teaches:

a first chemical reactor (reformer, 4, see Fig. 1A) comprising microchannels (compact plate style reformer with channels, see col. 28 lines 32-38 and see channels in Figs 6 and 7, for example) adapted to be in fluid communication with an inlet stream (liquid feed, see Fig. 1 A) and an outlet stream (Reformed Gas, see Fig. 1A) for carrying out a continuous process;

a second chemical reactor (catalytic combustor, 6a and 6b, see Fig. 1 A) in thermal communication with the first chemical reactor (see Fig. 1A, Where catalytic combustion portions 6a and 6b are in thermal communication with reforming portion 4);

wherein the first and second chemical reactors are coupled to each other (see flow diagram of Fig. 1A where reforming portion and catalytic combustion portion are fluidly connected);

wherein the first and second chemical reactors also include a heat exchanger upstream and downstream from said chemical reactors (see flow diagram in Fig. 1A where inlet and outlet streams of the first and second chemical reactors are in contact with a heat exchanger);

a pressure vessel (14) at least partially containing a operation therein (10, see Fig. 1), the pressure vessel concurrently adapted to be occupied by a medium (such as inert gas, supplied) to compress the chemical reactor in order to prevent any leaking of reactants or products from the chemical reactor by maintaining a pressure inside the pressure vessel higher than the pressure in the chemical reactor (page 1 lines 45-52);

a stream adapted to be in fluid communication with an inert medium source (same as inert gas mentioned above) for conveying the inert medium from the inert medium source and into fluid communication with the first chemical reactor (page I lines 45-52); and

a recycle stream for cycling the compressive medium into and out of the pressure vessel (see flow diagram of Fig. I).

In other words, modified Gonjo teaches a pressure vessel that maintains and controls a pressure differential between the pressure vessel and the chemical reactors, as discussed above, but fails to disclose the specific control mechanism that is used to maintain the pressures in the pressure vessel and the chemical reactor.

Toole also discloses a system that maintains and regulates pressures between a pressure vessel (shell, 5) that comprises an inert gas and a chemical reactor (wafer oxidation, 11).

Toole teaches a controller operatively coupled to a first sensor monitoring an internal pressure within the pressure vessel and a second sensor monitoring an internal pressure within the first chemical reactor (see outlet lines 22 and 23 from the pressure vessel and chemical reactor, respectively, which connect to back pressure regulators 61 and 64, which sense the pressure differential in the two spaces and adjust the outlet flows to reach the desired differential, see col. 4 lines 26-45). Furthermore, Toole discloses a vent (66) in fluid communication with the pressure vessel to selectively vent the inert medium (col. 4 lines 26-45). Toole teaches this configuration as a preferable means for simultaneously maintaining pressure control inside a pressure vessel as well as a chemical reactor inside said pressure vessel (col. 3 lines 3-17).

As such, it would have been obvious to one of ordinary skill to add the pressure control means of Toole, to modified Gonjo, in order to preferably control the pressure inside the pressure vessel at a higher pressure than that of the chemical reactors (as mentioned above}.

Regarding limitations recited in claim 58 which are directed to a manner of operating disclosed system, neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP §2114 and 2115. Further, process limitations do not have a patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ

666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim.

Response to Arguments

5. Applicant's arguments filed 3/5/09 have been fully considered but they are not persuasive.

On pages 14 and 15, Applicant argues that it would not have been obvious to combine the plate reactor of Gonjo with the pressure vessel of Reiser because Reiser already teaches a leak-proof reactor and one of ordinary skill would not have been motivated to apply a second measure to ensure against leaks. The examiner respectfully disagrees with this argument. Regardless of the structure of the plate reactor of Reiser, it is the examiner's position that one of ordinary skill in the art would recognize the benefit of using the pressure vessel of Reiser on any number of devices, including ones which are theoretically suppose to be leak-proof such as Gonjo, in order to ensure (as a "backup" measure) that reactants/products, such as flammable reactants/products, are not leaked into the atmosphere and wasted.

In response to Applicants argument (on page 15) that the examiner has not taken the invention of Reiser as a whole, the examiner respectfully disagrees. As stated before, it is the examiner's position that the teachings of Reiser, which include a pressure vessel which applies a positive pressure on a reactor vessel to ensure no leakage from the reactor vessel, is a feature that one of ordinary skill would recognize as being applicable to a wide variety of applications, not just the specific embodiment taught by Reiser.

On page 16, Applicant argues that the Gonjo reference teaches a conduit which comprises both steam and hydrocarbon and does not teach a separate conduit for steam and a separate conduit for hydrocarbon. The examiner respectfully disagrees with this argument. First, this argument is directed toward the material worked upon by the device, which does not distinguish an apparatus over the prior art (see MPEP §2114 and 2115). Second, the claim does not state that the two conduits are separate.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW J. MERKLING whose telephone number is (571)272-9813. The examiner can normally be reached on M-F 8:30-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. J. M./
Examiner, Art Unit 1795

/Alexa D. Neckel/
Supervisory Patent Examiner, Art Unit 1795